

*With regards
Albert H. Woods.*

FLORA OF NEBRASKA.

EDITED BY THE

MEMBERS OF THE BOTANICAL SEMINAR

OF THE

UNIVERSITY OF NEBRASKA.



INTRODUCTION:

Part 1. Protophyta - Phycophyta.

Part 2. Coleochaetaceae, Characeae.

LINCOLN, NEBRASKA, U. S. A.

PUBLISHED BY THE SEMINAR.

1894.

UNIVERSITY OF NEBRASKA.
FLORA OF NEBRASKA.
Published by the Botanical Seminar.

PART II.
COLEOCHAETACEAE, CHARACEAE.

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Branch III.—CARPOPHYTA.

Multicellular plants; plant-body, for the most part, a parenchymatous tissue aggregate, with or without chlorophyll; vegetative cells typically unmodified, cylindrical, or hexagonal; reproduction sexual and asexual; asexual reproduction in the chlorophyll series chiefly by means of tetraspores, in the hysterophytic series by means of stylospores, chlamydospores, and conidia proper; sexual reproduction by means of carpogones and antherids, resulting in the formation of a sporocarp.

Chiefly marine holophytes, or terrestrial hysterophytes. Plant body an undifferentiated aggregate of parenchyma-cells, forming a tissue mass, except in the *Perisporiaceae*, *Charophyceae* and the unicellular *Saccharomycetes*. Chlorophyll is absent in most of the orders. When present, it is often more or less masked by other substances, as the red and purple coloring matters of the *Rhodophyceae* and the lime incrustation of the *Charophyceae*. Asexual reproduction is typical of but two classes, *Ascomycetes* and *Rhodophyceae*. In the former, it results by means of conidia, stylospores, and, more rarely, by chlamydospores; in the latter uniformly by means of tetraspores. The fertilization of the carpogone by the contents of the antherid, typically through the medium of a trichogyne, produces a so-called sporocarp, which is characteristic of the branch. In the *Charophyceae*, however, the fertilization does not result in the formation of a sporocarp. In the hysterophytes, moreover, sexuality decreases with the distance from the point of derivation of the group until it finally disappears, but at the same time without a corresponding modification in the production of the sporocarp.

The relationships of the carpophytes are varied, and their inter-relations somewhat obscure. Through the holophytic series they connect in a nearly straight line, the Phycophytes with the Bryophytes, notwithstanding the evident break at the beginning of the series. On the other hand the hysterophytic series, which ends blindly at the upper end probably falls into two natural divisions, one of which, represented by the *Ascomycetes* and *Basidiomycetes*, has perhaps had its origin in or near the *Peronosporaceae*, while the other represented by the *Laboulbeniaceae*, etc., has its derivation and relationship still involved in great obscurity.

Class III.—COLEOCHAETEA.

Small green plants growing attached to submerged stems and leaves; thallus composed of branched rows of cells more or less united laterally into a flat, irregular or circular disk. Reproduction by sexually produced carpospores and asexual swarm-spores (zoogonidia).

The terminal cell of a branch which is to produce a carpospore swells, and the upper portion elongates into a narrow tubular process (trichogyne) which opens at the top. At the same time antherids develop from certain cells as small flask-shaped outgrowths, usually three or four from a cell. Each antherid thus formed cuts off from the mother-cell by a transverse wall, and the contents form a single biciliate antherozoid, which escapes and finds its way to the female cell, probably through the trichogyne. After fertilization, the female cell forms a wall around itself inside the old cell-wall, and the whole becomes enveloped by a coating of cells which grows up from below, thus forming a sporocarp with a single carpospore.

The *Coleochaete*ae are related to the *Ordovoniaceae* on the one hand and to the *Floridaceae* on the other. It is possible also that the origin of the great groups of the higher fungi is to be found in some such group as this. The nature and significance of the process of the formation of the sporocarp of the higher fungi has been a fruitful cause of discussion, and it has been commonly thought of late that it had no relation to the carpospore of the *Coleochaete*ae, or to the oospore of the Phycophytes, but was rather homologous to the asexual spore-formation of the lower fungi. But the *Laboulbeniaceae*, which according to recent investigation exhibit asexual reproduction of the same type as the *Coleochaete*ae and *Floridaceae*, indicate that this view is erroneous and that the origin of the higher fungi is to be sought in about the same place as that of the last named groups.

There is but one order and family:

Order 7.—COLEOCHAETACEAE.

Family.—COLEOCHAETACEAE.

The characters of the class. There is but one genus. A second one—*Chaetopeltis*—is thought by some to belong here also. It is distinguished from *Coleochaete* by the production of 2-4-8 swarm-spores in each spore mother-cell instead of a single one as in *Coleochaete*.

I. COLEOCHAETE BREB. Ann. Sc. Nat. Bot. 3, I., 29. 1844.

The characters of the family.

Etymology: Greek *κολεος*, sheath, and *χαίτη*, hair.

Coleochaete irregularis PRINGSII. Jahrb. II., 1-38, taf. 1-6. 1860.

Irregularly branched, cells 4 to 5-angled, 10-20 μ broad, usually 8-10 μ long or sometimes twice as long as wide; carpogones 10-60 μ in diam.

Grows in more or less extended irregular sheets closely adhering to the substratum. The cortication around the carpospore is sometimes only partially developed.

On *Lemna* and *Chara* spp. from Cherry county, and on *Nitella* from Minden. Pl. XXIII., Fig. 3, x100.

Coleochaete scutata BREB. l. c. t. II.

Thallus flat, bright green, .5-2mm. in diam., made up of dichotomously branched filaments united in a more or less lobed orbicular disc; cells thick-walled, 4-5-angled or rounded, 13-17 μ wide, 10-40 μ long; carpospore subglobose, 85-100 μ in diam.

Extremely variable as to size and shape.

On *Chara* from Cherry county. Plate XXIII., Fig. 1. x100.

Coleochaete orbicularis PRINGSII. l. c.

Thallus like that of *C. scutata*, but regularly orbicular, not lobed, .5-2 mm. in diam., cells usually isodiametric, 10-17 μ ; fruit as in *C. scutata*, but not so often found as in that species.

On *Lemna* and *Chara*, Cherry county, and on *Chara*, Minden. Pl. XXIII. Fig. 2. x100.

This species is probably only a variety of *C. scutata*.

Class VI.—RHODOPHYCEAE.

Thallus simple, or of branched filaments, or leaf-like or bushy in growth, showing more or less differentiation of cells into tissues; chlorophyll usually masked by some shade of red; carpogone as in *Colochoacte* consisting of a cell with an upward prolongation (trichogyne), but closed at the top; antherids produced singly or in clusters on the ends of branches; antherozoids without cilia. Asexual reproduction by non-motile tetragonidia (tetraspores) formed on certain branches or on any part of the plant body, but not usually found on sexual plants.

After fertilization, in the simpler forms (*Bangiaaceae*), the contents of the carpogone divide into eight parts which escape immediately as globular amoeboid cells and after a time come to rest, develop a cell-wall, and germinate. In the higher families the contents of the carpogone do not divide and escape after fertilization, but push out as lateral protuberances which are cut off as separate spores having the power to germinate immediately. There are also other groups of this class in which the formation of the carpospore is much more complex. In most cases after fertilization a coating of cells grows up from below the carpogone surrounding it as in *Colochoacte*. It will be seen that the reproduction of the lower forms differs only slightly from that of the *Oedogoniaceae* and *Colochoactaceae*, to which they are evidently closely related.

There is but one order.

Order 19.—FLORIDEAE.—The characters of the class. Mostly marine, but a few species widely distributed in fresh water.

But one family is represented in our limits.

Family.—NEMALIACEAE.

Plant-body gelatinous, composed of an axial, branched, articulate filament, often surrounded with a cortex of similar filaments, with horizontal, corymbose, or verticillate branches on which are borne the antherids and carpogones.

SYNOPSIS.

Axial filament covered with a loose cortication of similar filaments... *Batrachospermum*
Filaments not corticated..... *Chamanusia*

1. **BATRACHOSPERMUM** Roth. Fl. Germ. III, 450. 1800.

Axial filament surrounded by a cortex of similar parallel filaments, clothed with subglobose whorls of branchlets on the ends of which are borne the carpogones and antherids.

Etymology: Greek, *βατραχος*, frog, and *σπέρμον*, seed.

***Batrachospermum gelatinosum* (L.) A. F. Woods** Rep. Bot. Surv. Neb. III., 6. 1891.

Conferva gelatinosa LINNÉ Spec. Pl. 1166. 1753.

Batrachospermum moniliforme Roth l. c.

Plants 5-20 cm. long, 1-2 mm. broad, gelatinous, dark purplish-green; main stems and branches composed of an axial, articulate filament covered with a loose coat (cortication) of similar filaments from which arise at more or less regular intervals dense globular whorls of moniliform, dichotomously divided branchlets.

In springs, Bellevue.

Plate XXIV., Fig. 1, a portion of the plant body x50; Fig. 2, r branchlet x500; Fig. 3, branchlet with antherids; Fig 4, branchlet with young carpogone; Fig. 5, carpogone with antherozoids (corpuscula) attached. The carpospores have developed and cells from below have started to grow up around them, thus forming a sporocarp. (Figs. 3-5 after Bornet and Thuret.)

2. CHANTRANSIA DESV. Obs. Pl. des. Env. d'Angers. 1818.

Plants growing in tufts, bluish-green or violet, filaments irregularly branched, composed of a single series of cylindrical cells, not corticated; antherids one-celled, on the ends of short, clustered branches; carpogones at the ends of similar branches.

Eymology: dedicated to Chantrans.

This genus is of doubtful position. It may be placed in any one of several of the lower families of the *Florideae*. Many of the fresh-water species have been shown to be early stages of plants belonging to other well defined genera, as *Batrachospermum*, *Lemanea*, etc.

Chantransia violacea KÜTZ. Phyc. Germ. 231. 1845.

Plants 1-2 mm. long, arising from a thalloid mass of cells; filaments not greatly branched; cells 8-10 μ wide, 5-8 times as long as broad; branches fastigate; fruit on short, cylindrical branchlets.

Bellevue, with *Batrachospermum gelatinosum*.

Pl. XXIII., Fig. 4, a portion of thallus with filaments arising. A and B fruiting branches.

Class VII.—CHAROPHYCEAE.

Slender, submerged, aquatic plants, from a centimeter to a meter long, with monopodial racemose branching and verticillate leaves; stems rising in tufts or mats from the substratum to which they are fastened by slender rhizoids; sexual reproduction by means of carpogones and antherids, produced monoeciously or dioeciously in the axils or at the nodes of the leaves; asexual reproduction by means of stunted branches.

These plants are rich in chlorophyll, though this is sometimes masked by a thin coating of carbonate of lime, giving them an ashy-green appearance and making them very fragile.

The stems and branches are made up of a single row of long, cylindrical cells placed end to end. The leaves arising from the nodes are of the same structure. Around the axes there may be developed a coating of long tubular cells (cortication) parallel to the axial cell. The sexual organs consist of more or less globular carpogones and antherids, produced monoeciously or dioeciously in the axils, or at the nodes of the leaves. Each carpogone consists of a single, large, spirally corticated cell which after fertilization becomes a carpospore. The globular antherid is made up of eight "shields," within which is ultimately produced on each shield a tuft of filaments, each cell of which produces a spirally coiled, biciliate antherozoid.

The carpospore in germination produces a simple plant, the so-called pro-embryo, consisting of a single row of cells with limited apical growth. The sexual plant arises from this as a lateral branch.

The close relation of the *Bangiaceae* among the lower *Florideae* with the *Oedogoniaceae* and the *Coleochaeteae* has already been remarked. There is no essential point in the reproduction of the *Charophyceae* or in the structure of their plant-body that differs

From what is to be found in those groups, and their relation to them is evident. The origin of the Bryophytes is also, apparently, to be found in about the same place.

The class contains but one order.

Order 20. CHARACEAE.—The characters of the class; widely distributed in fresh and brackish water.

SYNOPSIS.

Stems, branches, and leaves never corticated and without stipules; crown of carpogone of ten cells,.....*Nitelleae*
 With or without cortication; stipules at the base of the leaf-whorls more or less developed; crown of five cells.....*Characeae*

Family. NITELLEAE.

Crown of the carpogone made up of two superimposed rings of five cells each; stems, branches, and leaves never corticated and without stipules; leaves 5-8 in a whorl, sometimes with smaller accessory leaflets, with 1-3 leaflet-bearing nodes; monoecious or dioecious; carpogones single or clustered, arising from the nodes of the leaves in the forkings of the leaflets; basal cell of the carpogone usually short, covering of spore without calcareous layer.

1. *NITELLA* Ag. Syst. Alg. 123. 1824.

Monoecious or dioecious, antherids terminal on short, basal cells, only apparently in the forks of the leaves; carpogones single or clustered, lateral on the nodes of the leaves, in monoecious species just beneath the antherids; crown 10-celled; leaves with several segments, but only 1 leaflet-bearing node; leaflets often repeatedly divided.

Etymology: Latin *niteo*, shine.

Nitella subglomerata A. Br. Monatsbericht Berl. Akad. 1858, 356.

Nitella acuminata subglomerata A. Br. of later publ.

Plants about 15-30 cm. long, diffusely branched; stems and branches about 1 mm. in diam.; leaves only slightly less in diameter than the stems; verticels of 6-8 similar leaves which are once forked, end segments *one-celled*, tapering to a sharp point; fertile verticels more or less contracted; monoecious, fructification not enveloped in jelly; antherids globular, 270-360 μ in diam.; carpogones often clustered below the antherids; spores 260-270 μ long, nearly globular, 230 μ wide, with 5-6 low spiral ridges, membrane of the mature spore very loosely reticulated or pitted.

Minden, York.

Pl. XXV., Fig. 1, part of a stem with leaves, natural size; Fig. 2, fruiting verticel x50; Fig. 3, spore x50; Fig. 4, membrane of a spore x350.

Nitella flexilis (L.) Ag. Syst. Alg. 121. 1824.

Chara flexilis L. Spec. Pl. 1157. 1753.

Plants rather long and not greatly branched; leaves long, 5-6 in a verticel, each divided into 1-1 terminal leaflets with rounded or short-pointed tips; monoecious, fructification not enveloped in jelly; antherids 450 μ in diam. (Allen), carpospore about 125 x 375 μ (Allen), often several at a node, crown evanescent.

Sometimes resembles *N. subglomerata* in general appearance, but may be distinguished by its larger antherids and carpogones and by the bluntish or short-pointed leaves.

Minden.

Pl. XXVI., Fig. 1, 1 a. branches, natural size; Fig. 2, 2 a. parts of leaves showing antherids and carpogones.

Nitella opaca Ag. l. c.

Plants 10-20 cm. long (5-30 cm., Allen), not greatly branched; verticels of 6-7 leaves usually divided into 2-3 terminal one-celled leaflets, abruptly sharp-pointed or bluntish as in *N. flexilis*, which this species resembles very much in habit; fruiting verticels contracted, though not so much as in *N. subglomerata*; dioecious, organs of fructification not enveloped in jelly; antherids variable in size, usually large (according to Allen sometimes 800 μ in diam.). carpogones 1-3 at a node, crown evanescent, spore 300-360x240-300 μ (Migula).

The dried plants are dark-colored and somewhat opaque.

In Deadman's Run, Lincoln.

Pl. XXVII., Fig. 1, part of a plant natural size; Fig. 2, part of a fruiting verticel x50; Fig. 3, spore x50.

Nitella mucronata A. Br. Schweiz. Char. 1847.

Chara mucronata A. Br. Ann. Sc. Nat. Bot. 1, II., 351. 1834.

Plants about 5-20 cm. long, branching freely, usually 6 leaves in a whorl, primary leaves branched into 2-5 secondary leaflets, these again branched into 1-3 ultimate 2-3 celled segments, end-cell mucroniform; monoecious, fructification not enveloped in jelly, fruit usually in all the divisions of the leaves; carpogones single or aggregated, spore 270-380 μ (Nordstedt), crown persistent.

This species may be easily distinguished from the other Nebraska species by the repeatedly branched leaves with mucroniform tips.

Minden.

Pl. XXVIII Fig. 1, part of plant natural size; Fig. 2, fruiting verticel x50; Fig. 3, spore x50.

Nitella translucens (PERS.) Ag. l. c.

Chara translucens PERS. Syn. II., 351. 1807.

Plants rather large, 10-40 cm. high, not greatly branched; whorls of sterile leaves 5-6, undivided, large, 1-celled, terminated by 4 2-celled, mucronate tips; fertile verticels contracted into small heads, 1-4 mm. in diam.; usually axillary, sometimes terminal, primary leaf 1-3 times divided into 4, ultimate leaflets 2-celled, end-cell mucronate, 95-126 μ long, 32-42 μ wide at the base, point thick-walled and sharp; monoecious; carpogones 1-2 at a node; spore 250-270 μ long, nearly as wide as long, dark brown, with 5-6 scarcely prominent ridges, membrane of the spore closely reticulated. York. The fruiting verticels of this plant are exactly like those described and figured by A. Braun in Nordstedt Fragm. as *N. axillaris* A. Br. But the spores of *N. axillaris* are said to be 290-310 μ long.

Pl. XXIX. Fig. 1, plant natural size; Fig. 2, fruiting verticel x50; Fig. 3, spore x50; Fig. 4, membrane x350; Figs. 6 and 7, end-cells of leaves x50.

FORM confervoides THUILL Flor. Env. Par. 1790.

Plants very much smaller and more branched than the type; main stems only 270 μ in diam.; leaves and leaflets in whorls of 4-5, usually 4; primary seg-

ments in fruiting verticels 900 μ long, 90 μ broad, secondary segments 500 μ long, 80 μ wide, tertiary segments 1-1.5 mm. wide, 85 μ long tipped with a sharp, cuspidate cell as in the species; carpogones as in the species.

The plant found here is very much smaller than any described form of *N. translucens*. The general size and habit is that of *N. tenuissima* (Desv.) Coss. & Germ. form, *minor* A. Br., but the spore-characters and the structure of the mucronate cells of the leaves show undoubted connection with *N. translucens*.

Pl. XXX., Fig. 8, branch with fruiting verticel x50; Fig. 5, end-cells of leaflet x350.

[*TOLYPELLA* has the general habit of *Nitella*, from which it may be distinguished by the following characters: leaves with 2-3 nodes bearing primary leaflets, always monoecious, antherids lateral, often with long basal cell, carpogones clustered. No species of the genus have as yet been observed in Nebraska, but from the reported distribution of several of them it is likely that some will be found.]

Family. CHAREAE.

Crown of the carpogone made up of five cells; stems and leaves with or without cortication; stipules at the base of the leaf-whorls, more or less developed, one-celled; leaves 6-15 in a whorl; carpogones and antherids on the upper sides of the leaves, spore usually coated with a calcareous layer.

The family contains four genera, of which only one is here represented.

1. CHARA L. Sp. Pl. 1156. 1753.

The characters of the family.

Etymology: Greek *χαρά*, joy.

Chara coronata Ziz. in A. Br. Alg. Bot. Zeit. 4, 59. 1835.

Plants usually large, from a few centimeters to a meter long, short forms usually much branched with firm, broad stems and leaves, 1-1.5 mm.; long forms with cells less firm and narrower, no cortication, stipules at the base of the leaves forming a simple whorl; leaves long, 3-10 cells, ending in a crown of 3-5 mucronate cells; monoecious, carpogones and antherids produced usually at all the nodes of the leaves, antherids variable, 250-300 μ in diam., carpogones variable, crown large, cells rather long, usually spreading, sometimes connivent; spore 150-500 μ , black, bracts extremely variable, from very much shorter than the carpogone to three times as long—quite variable on the same plant.

Common all over the state.

The specimens collected at York in 1893 by Miss Hopper are long, slender plants, spores 150-504x270-306 μ , bracts very short, 3-5 times as long as wide, acuminate, leaves 3-6 celled. Pl. XXX., Fig. 1, part of plant natural size; Fig. 4, carpogone x50. The specimens in the herbarium of the Botanical Survey from Cherry county and from Greenwood are larger and more branched; nucleus (Greenwood specimens) 504-540x280-300 μ ; bracts 1-3 times as long as the carpogone; (Cherry county specimens) 540-556x300-320 μ , bracts about equal to the carpogone.

Pl. XXX., Fig. 2, part of plant, natural size; Fig. 3, node with carpogones x50; Fig. 5, young carpogones and antherids x50; Fig. 6, stem with bases of leaves showing stipules x25; Fig. 7, end-cells of leaf x50.

Chara contraria A. Br. Schweizer Char. 15. 1817, Nordst Fragm. 141. 1882.

Plants rather long, 20-40 cm., not greatly branched; branches usually short; stems and branches corticated; cortex-cells twice as many as the leaves in the whorl next above; primary (or spine-bearing cortex cells) usually most prominent; stipular whorl double; stipules ultimately falling off, leaving two rows of scars; leaves 6-10 in a whorl, variable in length and number of corticated nodes, lower node always corticated; end-cell of the leaf not corticated, short and obtuse; whorls often remote; monoecious, 1-4 fertile joints; antherids small, 300-321 μ in diam. (280-350 μ Migula); carpogones large, 900 μ long; crown short and blunt; spore 570-612x370-380 μ ; dark brown; 10-14 striate; bracts usually shorter than the carpogone.

Fremont, ponds in Cherry county; Ponca river, Boyd county.

May be distinguished from *C. foetida* by the larger spore. According to Migula the spores of *C. foetida* are never longer than 550 μ and those of *C. contraria* never shorter than 550 μ .

Pl. XXXI., Fig. 1, part of a plant natural size; Fig. 2, part of stem showing cortication, leaf-whorl, and stipular whorl x50; Fig. 3, part of leaf showing naked end-cells and two fertile corticated nodes x50; Fig. 4, cross section of stem x50, (a) young spine.

Chara foetida A. Br. Ann. Sci. Nat. Bot. 1, 11., 354. 1834. Flora 1835, p. 63.

General habit like *C. contraria*, but more branched and leaf whorls less remote; stems and branches corticated; cortex-cells twice as many as the leaves in the whorl next above; primary (or spine-bearing cells) usually less prominent than secondary cells; stipular-whorl double and prominent; stipules persistent for some time and *not blunt* as in *C. contraria*; leaves 6-10 in a whorl, with 1 to several corticated nodes, and 1 or more naked ones; end-cell of the leaf acute (not blunt as in *C. contraria*); monoecious; 1-4 fertile joints; antherids about 330 μ in diam.; carpogones small; crown short, blunt; spores 485-540x370-380 μ ; dark brown; 10-14 striate; 2 bracts at fertile joints longer than the carpogone, and 2 the same length or shorter.

Variations in the length of the bracts and the development of spines give several forms:

Form SUBINERMIS LONGIRACTEATA A. Br.—Spines very short or not developed, bracts very long, 2-4 times the length of the carpogone.

Pumpkinseed creek, Cheyenne county; Kimball; Cherry county; Ponca river, Boyd county.

Form SUBHISPIDA MICROPILA ET BRACHYTELES A. Br.—Spines developed; bracts shorter than the carpogone; end-segment of leaf short.

Buffalo creek, Haigler.

Form SUBHISPIDA MACROPILA ET MACROTELES. A. Br.—Bracts longer than the fruit; end-segment of leaf long.

Cherry county.

Pl. XXXII., Fig. 1, plant natural size; Fig. 2, part of stem showing one entire leaf and the bases of the other leaves of a whorl (the leaf bent in order to get it on the plate), (a), stipules, (b), spines; Figs. 3-4, cross sections of stem, 3 a, spine coming from primary cortex cell x50.

Chara crassicaulis SCHLEICH. Cat. Pl. Helv. 1821.

Chara foetida crassicaulis A. Br. Ann. Sci. Nat. Bot. 1, 11, 355. 1831.

General habit of plant intermediate between *C. foetida* and *C. contraria*; stems and branches strongly coated with lime and from .5-2 mm. thick; cortex cells double the number of the leaves and strongly developed; primary cells more or less prominent than the secondary, usually about equally developed; stipular whorl double; stipules usually short and blunt as in *C. contraria*; leaves in whorls of 6-10, usually 8-9, 1-8 celled, with 1-5 corticated nodes, the naked cells usually long, end-cell bluntish; monoecious, 1-1 fertile joints; antherids large, 150-540 μ in diam.; carpogones intermediate between *C. contraria* and *C. foetida*; spore black or very dark brown, 510-630 μ long, about 375 μ wide; bracts once to twice as long as carpogone.

Form SUBINERMIS MACROPHYLLA.—Spines only slightly developed; bracts as long or twice as long as the fruit; leaves usually long.

Form SUBHISPIDA MACROPHYLLA LONGIBRACTEATA. —Spines .5-2 mm. or more long; leaves usually long, bracts long and broad, 3-5 times as long as fruit.

The forms, especially the last, more common than the type; usually growing together.

Pine Ridge (type and forms mixed), Haigler (form 2).

Pl. XXXIII. (form 2) Fig. 1, part of plant natural size; Fig. 2, part of stem showing stipular whorl, bases of leaves, and 2 fertile nodes of a leaf; Fig. 3, carpogone with spores; Figs. 4-5, cross section of stem, 5, a, b, spines growing from primary cortex cells. $\times 50$.

Chara evoluta ALLEN. Bul. Torr. Bot. Club 1882, p. 5 pl. 19.

Plants short, 10-15 cm. long, much branched, not coated with lime; leaves 6-10 in a whorl, whorls numerous, 4-5 corticated nodes and two short naked nodes; end-cell acuminate, corticating cells about the same number as leaves, secondary cells more or less intermixed; stipular whorl double; stipules long; spines long, numerous, mostly in fascicles of 2-3; monoecious, 3-4 fertile nodes on each leaf; antherids 270-386 μ in diam.; carpogones 810 \times 540 μ ; crown not as high as broad, only slightly or not at all contracted at the base; spore dark brown or black, 612-630 \times 340-390 μ , with about ~~ten~~ more or less distinct striae.

In a lake, Sheridan county, Smith & Pounl No. 261.

This plant appears to be intermediate between *C. contraria* and *C. crinita*. It is almost exactly like the latter species except that *C. crinita* is dioecious.

Pl. XXXIV., Fig. 1, part of plant natural size; Fig. 2, part of stem showing bases of leaves of a whorl with one entire leaf and stipular whorl; 2, a, b, c, spines; Figs. 3, 4, 5, cross-sections of stem; Fig. 6, spore $\times 50$; Fig. 7, spore $\times 100$.

Chara fragilis DESV. in Loiseleur Not. Fl. Fr. 157. 1810.

Plants long and slender, rather rigid; stems evenly corticated, cortex-cells 3 times as many as leaves in whorl next above; stipular ring double, stipules very short; leaves long and pointed, 5-8 corticated segments and one or two short, naked segments at the end; end-cell pointed; 6-9 leaves in a whorl, whorls either close or remote; monoecious; 3-4 fertile joints on each leaf; antherids 270-360 μ in diam.; carpogones long and narrow; crown 180-200 μ high, as broad as high; spore dark brown, nearly black.

630-810 μ long, about 360 μ broad, several sharp prongs at the base; bracts at the fertile joints variable in length, usually somewhat shorter than the carpogone.

Whitman, lakes in central Cherry county.

Pl. XXXV. Figs. 1, 1 a, parts of plants natural size; Fig. 2, part of stem showing bases of leaves of a whorl and two fertile nodes; 2 b, stipular whorl; 2 a, remainder of leaf shown in 2; Fig. 3, carpogone containing spore; Fig. 4, cross-section of stem, x50.

Chara sejuncta A. BR. Pl. Lindh. 56. (Bost. Journ. Nat. Hist. 1845 p. 263.)

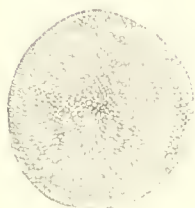
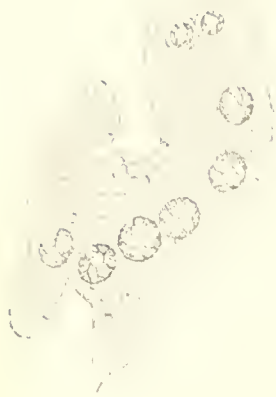
General habits of *C. fragilis*; stem triply corticated; leaves long, in whorls of 8-12, with 6-10 segments, the lowest or first segment short, *not* corticated, all the others corticated, last segment tipped with several short spines; stipular whorl well developed, of 3 series of stipules, spines on the stem short and sharp; monoecious, but antherids and carpogones borne at different joints, *not together*; antherids about 360-380 μ in diam.; spore of carpogone 630x360 μ , crown of *long, narrow* cells spreading or connivent. Minden.

Pl. XXXVI, Fig. 1, part of plant natural size; Fig. 2, part of stem showing lower naked segments of the leaves of a whorl and stipular ring, 2, a, b, c, leaf with fertile nodes; Fig. 3, cross-section of stem, 3a, spine, x50.

DESCRIPTIVE
PLATES TO PART II.

PLATE XXIII. x100.

- Fig. 1 *Coleochaete scutata*
 " 2 *Coleochaete orbicularis*.
 " 3 *Coleochaete irregularis*.
 " 4 x350, *Chantransia violacea*,
 a, b, fruiting branches.



2



4

PLATE XXIV.

BATRACHOSPERMUM GELATINOSUM.

- Fig. 1, Portion of plant body. x50.
" 2, Branchlet. x500.
" 3, Branchlet with antheridia.
" 4, Branchlet with young carpogone.
" 5, Carpogone with antherozoids.

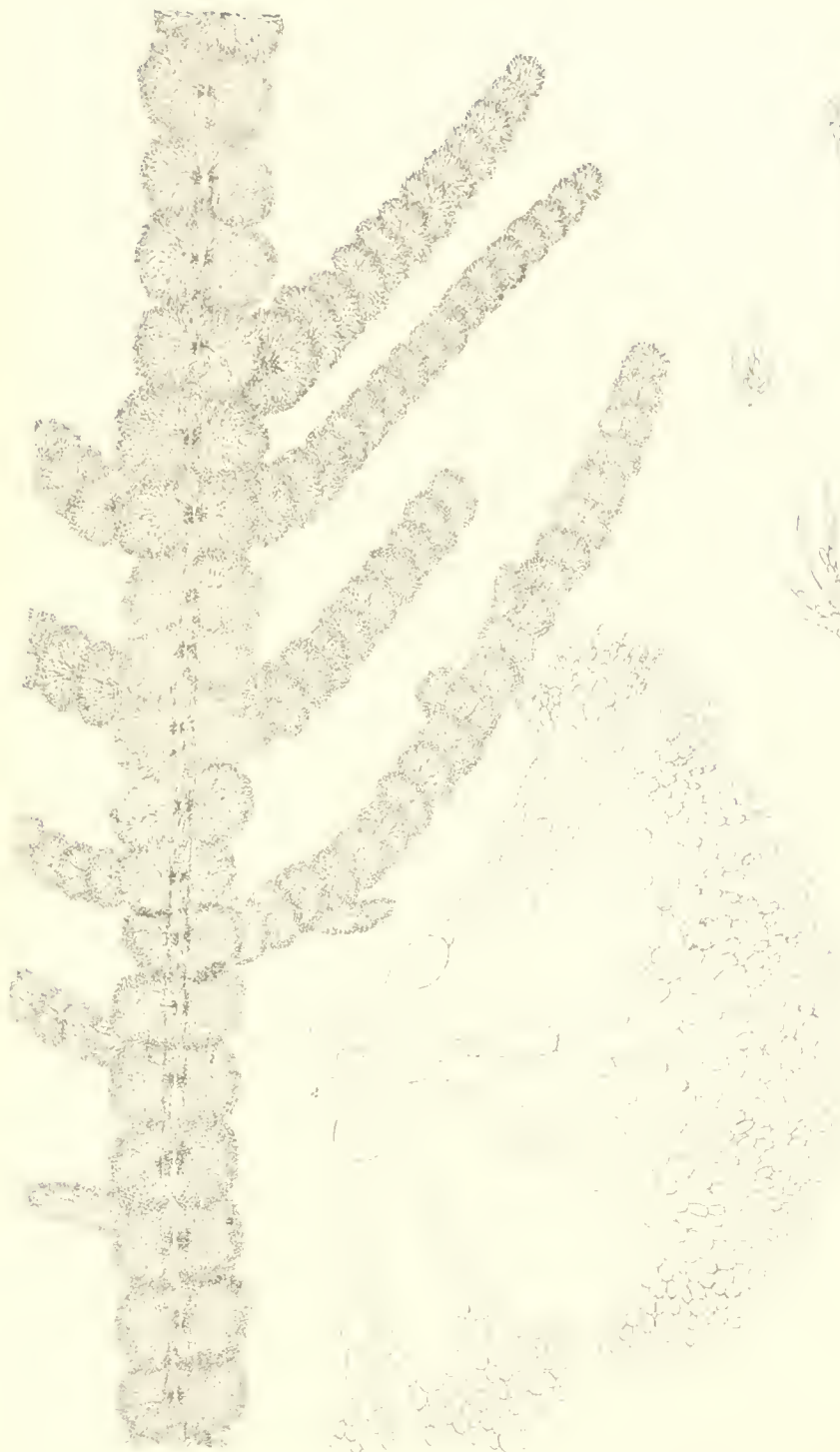


PLATE XXV.

NITELLA SUBGLOMERATA.

Fig. 1, Portion of stem, natural size.

" 2, Fruiting verticel. x50.

" 3, Spore. x50.

" 4, Membrane of spore. x350.

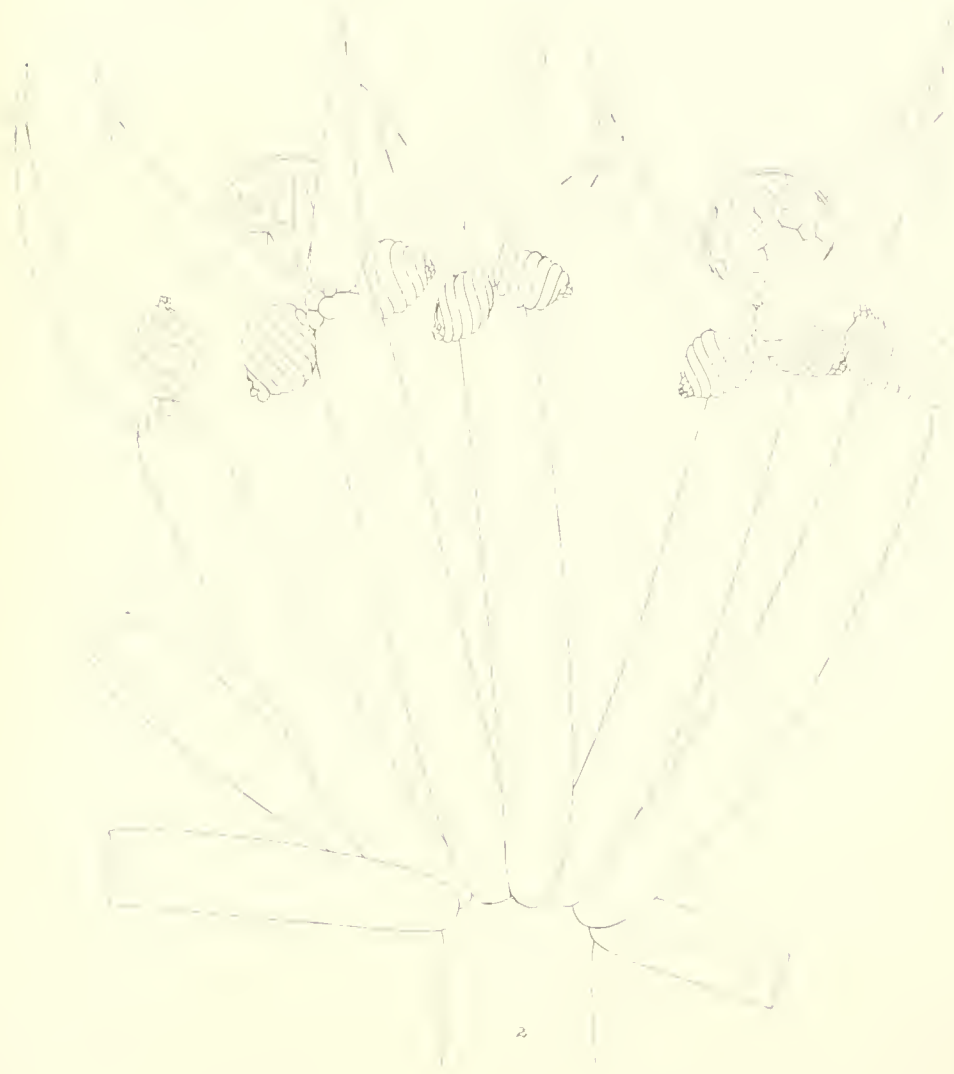


PLATE XXVI.

NITELLA FLEXILIS.

Fig. 1, 1 *a*, branches, natural size.

" 2, 2 *a*, parts of leaves showing antherids and carpogones.

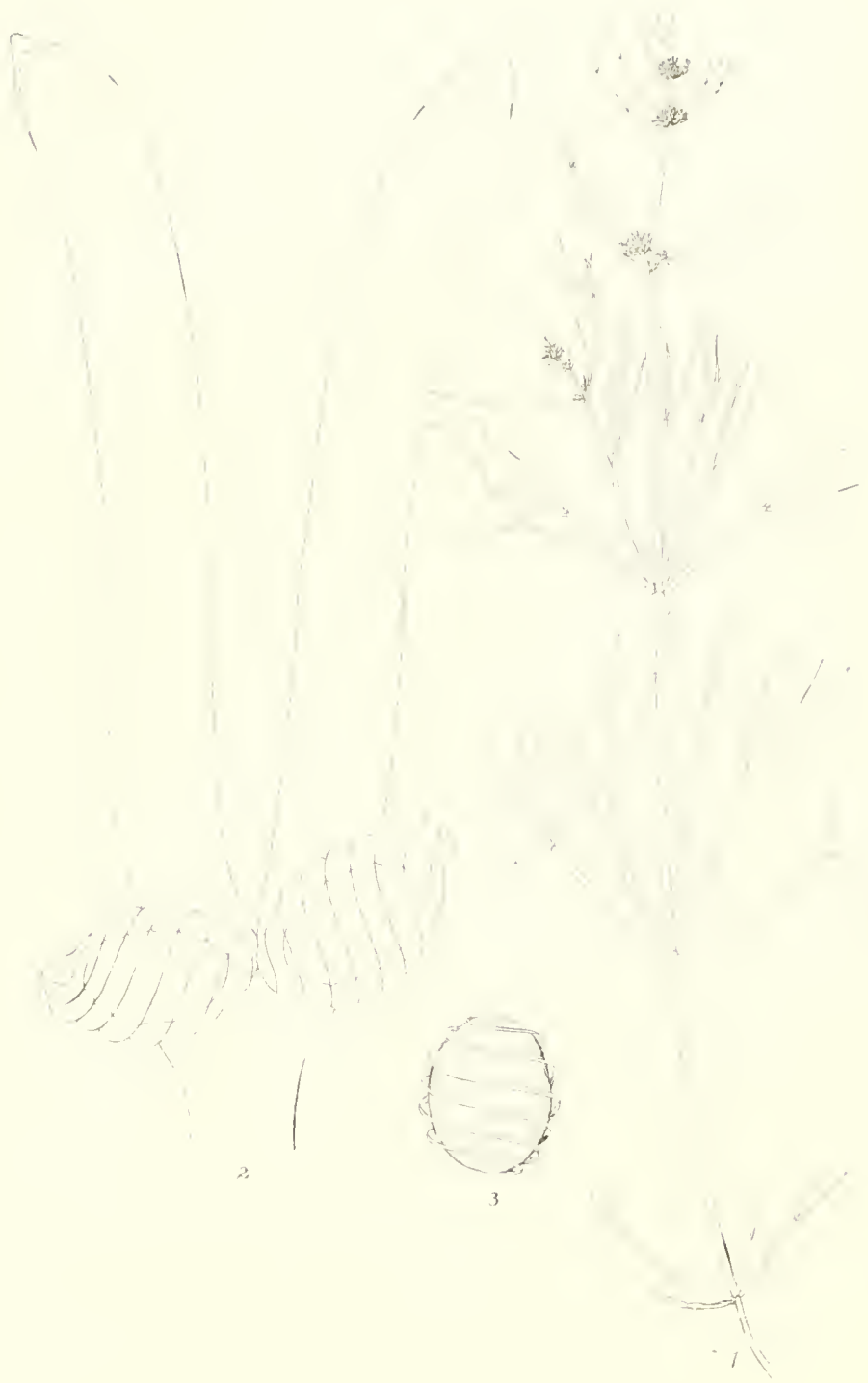




PLATE XXVII.

NITELLA OPAKA.

- Fig. 1, Part of a plant, natural size.
" 2, Part of a fruiting verticel. x50.
" 3, Spore. x50.



2

3

PLATE XXVIII.

NITELLA MUCRONATA.

- Fig 1. Part of a plant, natural size.
" 2. Fruiting verticel. x50.
" 3. Spore. x50.
" 4. Membrane of spore. x350.

A



3



7



2

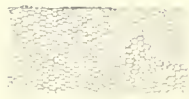


4

PLATE XXIX.

NITELLA TRANSLUCENS.

- Fig 1, Plant, natural size.
" 2, Fruiting verticel. x50
" 3, Spore. x50.
" 4, Membrane of spore. x350.
" 6, 7, End-cells of leaves. x50.
 Forma confervoides.
" 5, End-cells of leaflet. x350.
" 8, Branch with fruiting verticel. x50.



4



B

5

6

7

PLATE XXX.

CHARA CORONATA.

Fig. 1, Part of plant, natural size.

" 2, Part of plant, natural size.

" 3 Node with carpogones. x50.

" 4, Carpogone. x50.

" 5, Young carpogones, and antherids. x50.

" 6, Stem with bases of leaves, showing stipules. x25.

" 7, End-cells of leaf. x50.

PLATE XXXI.

CHARA CONTRARIA.

Fig. 1, Plant, natural size.

" 2, Stem, showing cortication, leaf, and stipular whorl. x50.

" 3, Part of a leaf showing naked end cells, and two fertile corticated nodes. x50.

" 4, Cross-section of stem; a young spine. x50.

PLATE XXXII.

CHARA FOETIDA SUBHISPIDA MACROPTILA.

Fig. 1, Plant, natural size.

" 2, Part of stem, showing one entire leaf, and the bases of the others of the whorl; *a*, stipules; *b*, spines. x50.

" 3, 4, Cross-sections of stem; 3 *a*, spine coming from primary cortex-cell. x50.

PLATE XXXIII.

CHARA CRASSICAULIS SUBHISPIDA LONGIBRACTEATA.

Fig. 1, Plant, natural size.

- " 2, Stem, showing stipular whorl, bases of leaves, and two fertile nodes. x50.
- " 3, Carpogone with spore. x50.
- " 4, 5, Cross-sections of stem; 5 *a, b*, spines growing from primary cortex-cells. x50.

PLATE XXXIV.

CHARA EVOLUTA.

Fig. 1. Plant, natural size.

" 2. Stem, showing bases of leaves of a whorl, with one entire leaf
and stipular whorl; 2. *a*, *b*, spines. x50.

" 3, 4, 5. Cross-sections of stem. x50.

" 6. Spore. x50.

" 7. Spore. x100.

PLATE XXXV.

CHARA FRAGILIS.

Fig. 1, 1 a, Parts of plants, natural size.

" 2, Part of stem, showing bases of leaves and two fertile nodes;

2 *b*, stipular whorl; 2 *a*, remainder of leaf shown in 2. x50.

" 3, Carpogone containing spore. x50.


" 4, Cross-section of stem. x50.



PLATE XXXVI.

CHARA SEJUNCTA.

- Fig. 1, Plant; natural size.
" 2, Stem, showing lower naked segments of the leaves of a whorl,
and stipular ring (s. s.); 2 *a, b, c*, leaf with fertile nodes. x50.
" 3, Cross-section of stem; 3 *a*, spine. x50.

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